DECEMBER 1978
No. 12

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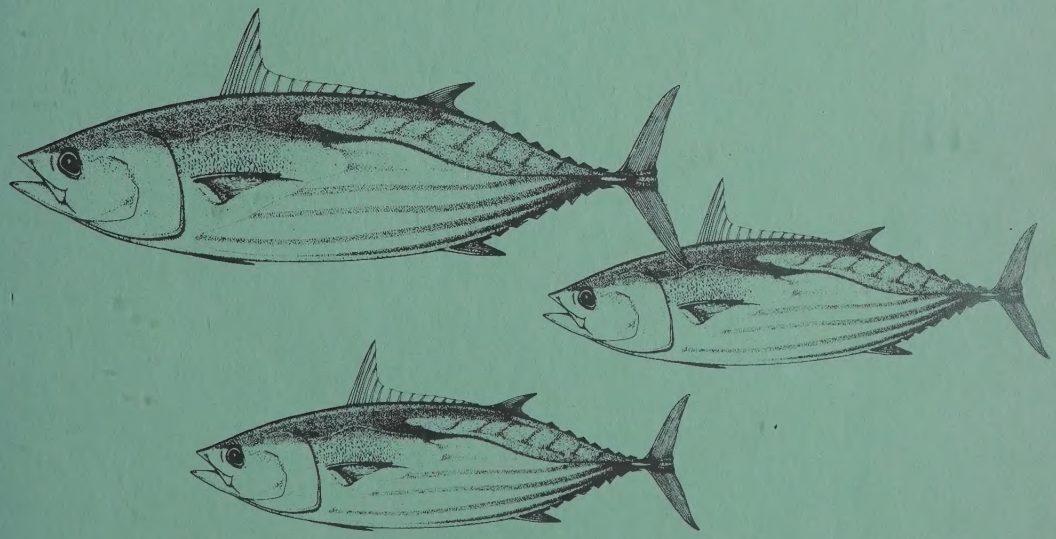
Southwest Fisheries Center-La Jolla, California



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FISHING INFORMATION

DECEMBER 1978, No. 12

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J. Carr, Deputy Director

PREFACE

This publication, Fishing Information, appears monthly and contains 1) fishery advisory information, 2) a narrative description of pertinent surface temperature conditions, 3) charts of winds and pressures for the eastern North Pacific, 4) charts of sea surface temperature for the North Pacific and eastern tropical Pacific, and 5) charts of subsurface temperature structure in the eastern North Pacific.

A supplement to Fishing Information appears at 15-day intervals throughout the year. It contains a chart of sea surface temperature (contoured at 2°F (1°C) intervals) from Baja California to Vancouver Island out to about 135°W. Special bulletins are published in conjunction with the 15-day sea surface temperature charts which include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate during the albacore fishing season.

To cancel delivery of this publication in the event you no longer need to receive it, or to change the delivery address if you are moving but still need to receive it, please notify us by writing: James A. Renner, Editor, Fishing Information, National Marine Fisheries Service, Southwest Fisheries Center, P. O. Box 271, La Jolla, California 92038.

Submitted for publication - January 30, 1979.

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ENVIRONMENTAL CHARTS ANALYZED BY:

F. Miller (Figures 8 and 9)
J. Renner (Figures 1, 2, 3, 4, 5, 6, 7, and 15 day supplement)

TECHNICAL EDITOR:
R. Allen
CARTOGRAPHY:
R. Allen, E. Portillo

Acknowledgements

The following organizations and stations contributed data for December 1978 charts:

Inter-American Tropical Tuna Commission, La Jolla, California
Kelco Company, San Diego, California
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, La Jolla, California; Honolulu, Hawaii
National Weather Service, San Diego, California and Washington D. C.
National Ocean Survey, Pacific Marine Center, Seattle, Washington

Fisheries Research Board of Canada, Pacific Environment Institute, West Vancouver, British Columbia by L. F. Giovando from observations by:
J. Redhead at Langara Island Light; C. Hilliar at Cape St. James Light;
L. Collins at Kains Island Light; M. V. Stewart at
Amphitrite Point Light

Scripps Institution of Oceanography, La Jolla, California

Expendable bathythermograph and salinity observations are made by the mates and engineers of the *Hawaiian Queen* of the Matson Navigation Co. The data are processed under supervision of D. R. McLain at the NMFS Pacific Environmental Group, Monterey, California, using computer facilities of the Fleet Numerical Weather Central, Monterey. The project is partially supported by the National Science Foundation and the Office of Naval Research.

Sea Surface Temperature and Environmental Conditions

Forrest R. Miller

Eastern North Pacific

Sea surface temperatures (SST) normally reflect seasonal cooling in December. The greatest cooling occurs between the Aleutian low and eastern Pacific high pressure centers. The Aleutian low is normally centered near 60°N, 145°W and the Pacific high near 32°N, 135°W (Figure 1). The north Pacific Ocean front usually lies between 35°N and 45°N which is the southern boundary of maximum cooling in December. Weather fronts frequently develop along the southern boundary of the ocean front and surface winds and ocean mixing intensify as the weather systems move eastward along the southern periphery of the Aleutian low.

During December 1978 there was a pronounced northward bulge in SST's between 130°W and 150°W from 40°N to 50°N (Figure 3). This was associated with a northwestward displacement of the subtropical high pressure center to 35°N, 150°W (Figure 2), which was approximately 600 NM west of the high pressure center in November 1978. The Aleutian low pressure center remained in the Bering Sea near 57°N, 178°E, which was several hundred miles west of its normal position. From the high pressure center to the coasts of Alaska and North America, surface pressures were 4 to 12 millibars above normal. Over the eastern Pacific, north of 40°N, surface winds and ocean wind mixing were greater than normal as a result of the westward displacement of the subtropical high pressure center and a stronger than normal pressure gradient between the Aleutian low and Pacific high pressure centers.

Along the U.S. west coast, stronger than normal surface winds prevailed east of 130°W and weather systems, accompanied by extensive rains and cold air outbreaks, penetrated farther south than normal into the southwestern U.S. and Baja California.

The SST pattern (Figure 3) showed a strong east-west temperature gradient off the U.S. west coast between 35°N and 45°N where negative departures greater than 2°C developed (Figure 5). The negative SST departures east of 130°W resulted from a combination of strong ocean mixing, coastal upwelling and the southward advection of cold water after storm passages. SST's along the entire west coast and Baja California were 1 to 2°C colder in December 1978 than in December 1977 (Figure 7). The westward shift of the subtropical high pressure system and a more southerly penetration of weather systems were the primary factors related to a more rapid than normal cooling of coastal waters. The area covered by positive SST depatures greater than 1°C increased markedly north of 35°N and west of 135°W (Figure 5). A similar pattern of positive SST departures is shown in the comparison of December 1978 and 1977 (Figure 7). The absence of any significant negative SST departures between 140°W and 170°W in December 1978 was due primarily to the westward displacement of the Aleutian low and Pacific high pressure centers. Although surface winds and ocean mixing was stronger than normal north of 40°N, SST's cooled at below normal rates because of an apparent northward advection of warmer water on the western and northern periphery of the subtropical high pressure system. Southeast of the high pressure center, SST's were more than 1°C below normal (Figure 5) and below those of December 1978 (Figure 7) where surface winds were stronger and weather fronts were more active than usual. South of 20°N a band of positive SST departures extended across most of the subtropical Pacific (Figures 5 and 9) where the average northeast trade winds were slightly weaker than normal and significantly weaker than in December 1977. A year ago the subtropical high pressure center was about 500 NM southeast of its normal position, as opposed to this year, when the center was displaced an equal distance to the west.

Western North Pacific

During December, intense low pressure systems frequently developed west of 160°E between 45°N and 50°N and moved eastward, which caused high winds, rough seas and severe weather along the outer edges of the storms. Heavy cloud cover and deep-ocean wind mixing between 40°N and 45°N and along 50°N caused SST's to cool faster than normal, and negative SST departures greater than 1°C (Figure 6) developed along the storm paths. The development and eastward movement of weather fronts between Japan and 170°E reflect the alternating areas of positive and negative SST departures (Figure 6) which helped maintain a strong north Pacific ocean front between 38°N and 42°N (Figure 4). South of 40°N and west of 175°E, the large areas covered by positive SST departures were under the influence of the western Pacific high pressure system. Most of the weather fronts, which developed east of Japan, extended southward between 140°E and 170°E. The areas of negative SST departures from 20°N to 40°N were associated with weather fronts extending southwest from low pressure centers.

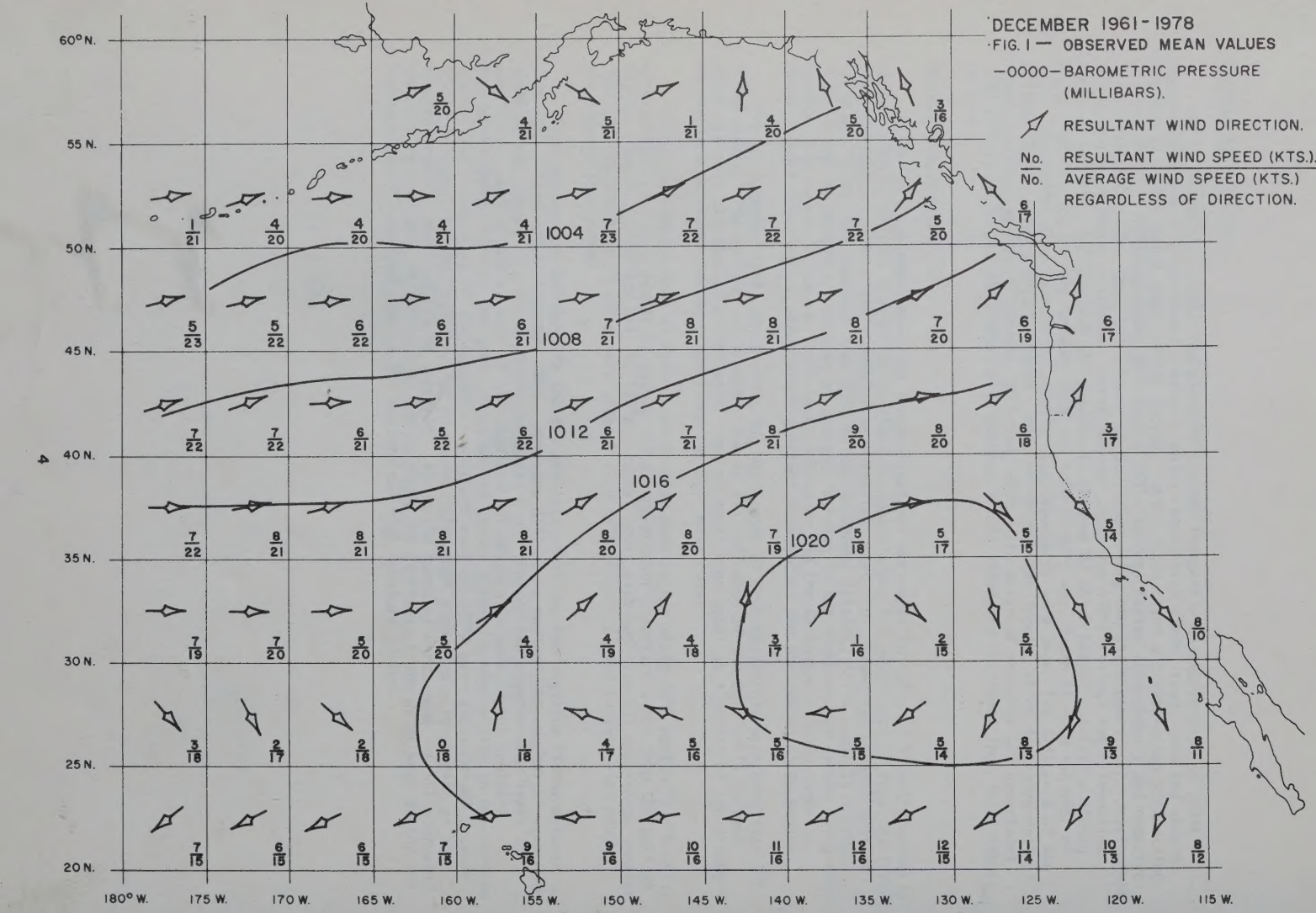
Eastern Tropical Pacific

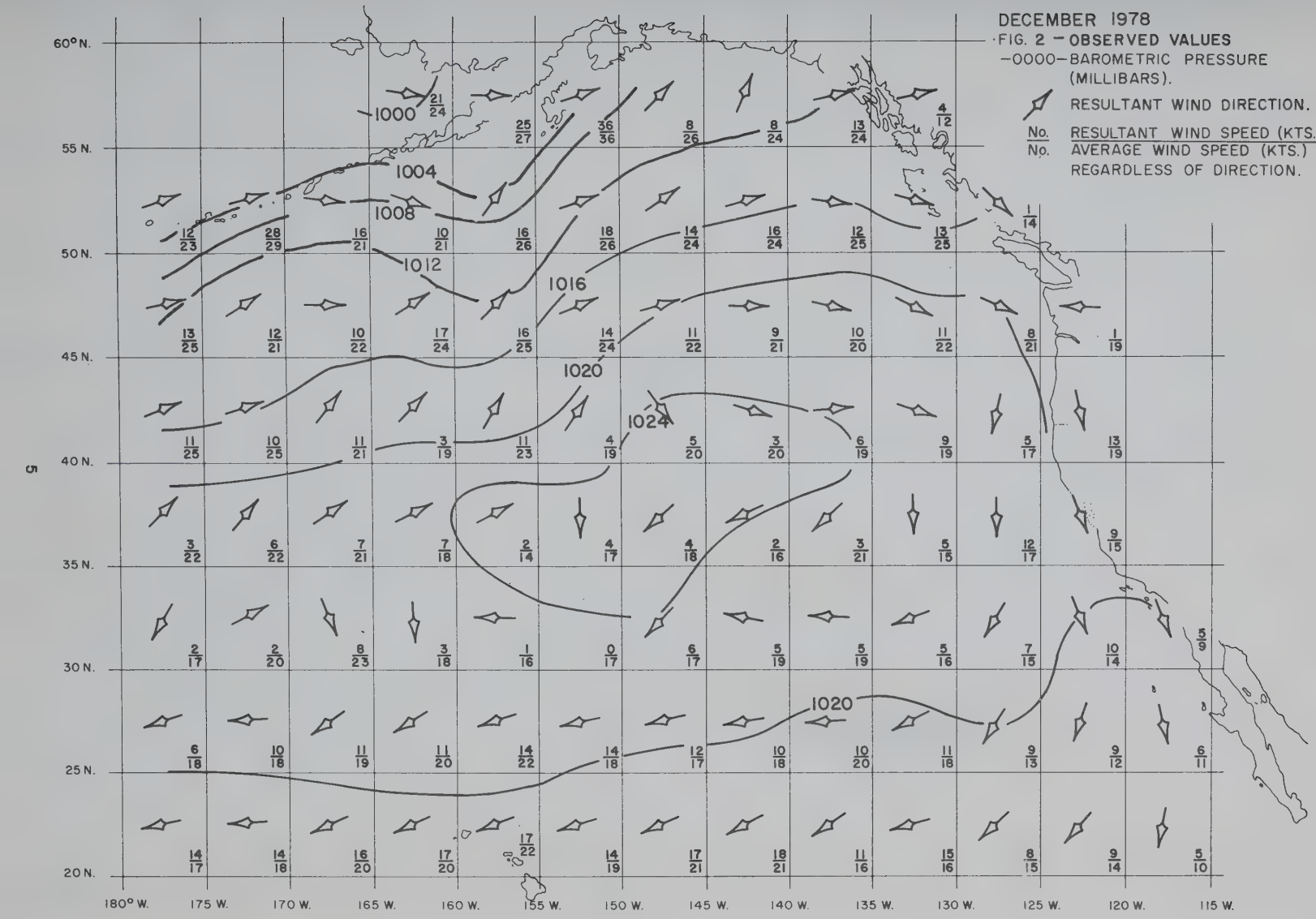
In the northern hemisphere the largest seasonal decreases in SST's of 1 to 2°C normally occur in the California Current which flows southward along the west coast of Baja California. Elsewhere south of 25°N, SST's usually decrease less than 1°C. Along the equator east of 120°W and in the Peru Current from 30°S to the Galapagos Islands, SST's normally increase 1 to 2°C during December. Because of seasonal warming in the southern hemisphere along the equator, the equatorial ocean front between Ecuador and the Galapagos Islands normally shows a weaker north-south temperature gradient than during the preceeding three months.

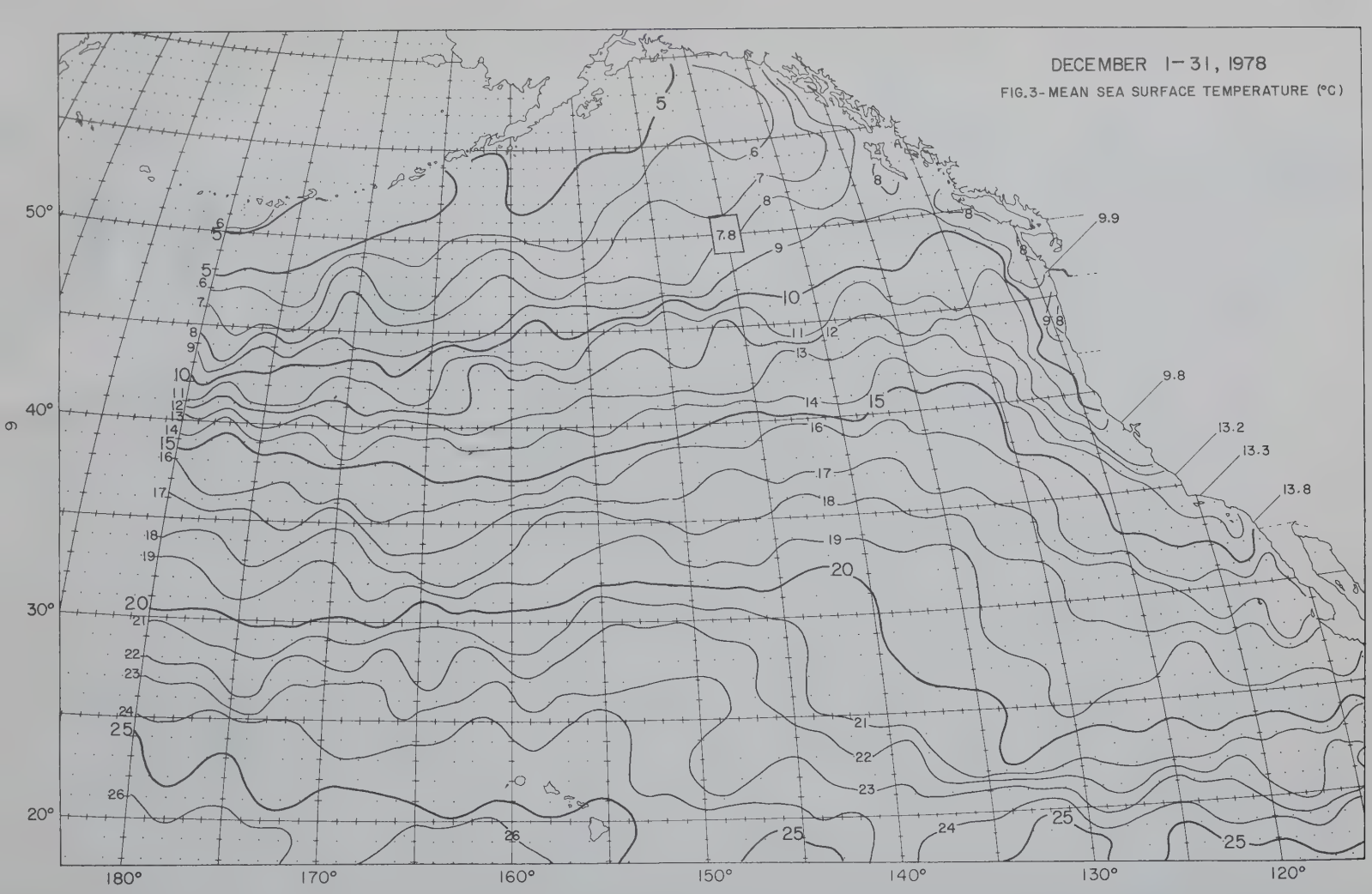
During December 1978, SST's along the west coast of Baja California were more than 1°C below normal. The cooling was probably due to the influence of the California Current which may have transported colder water farther south than usual as a result of the strong northerly wind stress on the ocean along the U.S. west coast.

Along the inshore area of Mexico and Central America and along 10°N east of 110°W SST's were below normal as a result of steady and strong northerly surface winds from the Gulf of Mexico. South of 20°N and east of 135°W, several areas with positive SST departures greater than 1°C developed where SST's were greater than 27°C (Figure 8) and surface wind mixing was lighter than normal.

Along the equator between 2°N and 2°S and east of 110°W, the negative SST departures were not as large as in November 1978. However, SST's over most of the equatorial area were below normal, especially where strong southeast winds crossed the equator over areas of upwelling. West of 130°W, most of the negative SST departures were in the southern hemisphere where tropical and subtropical storms caused extensive wind mixing in the surface layer. SST's over most of the southern hemisphere east of 120°W were above normal because of the influence of the southern high pressure system that dominated a large part of the tropical Pacific south of 5°S in December. Along the coast of Peru, negative SST's greater than 1°C covered most of the coastal region where the southeast trade winds were steady and strong along the eastern edge of the subtropical high pressure system.

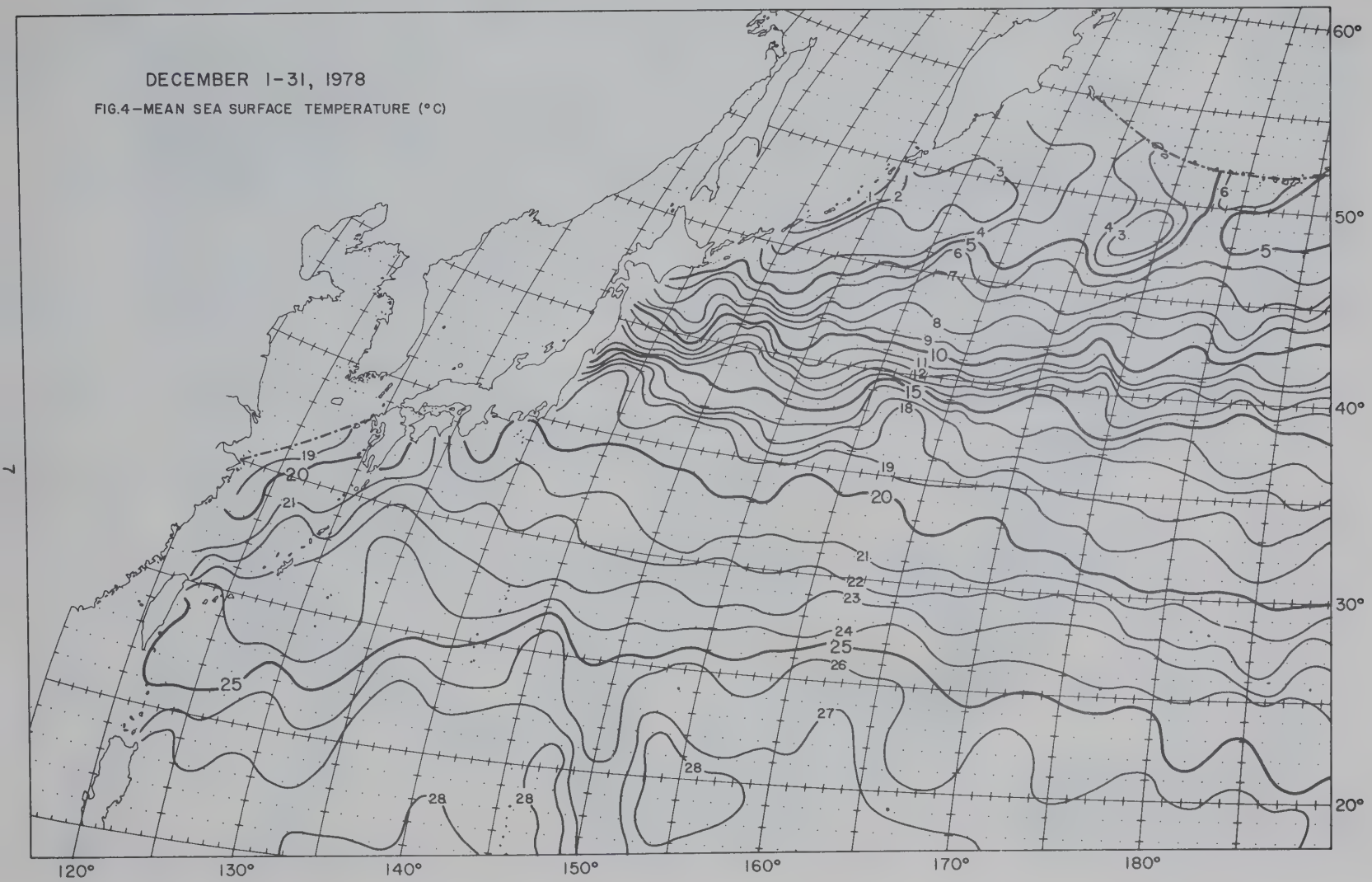

DECEMBER 1961-1978
FIG. 1 — OBSERVED MEAN VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1004
1008
1012
1016
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

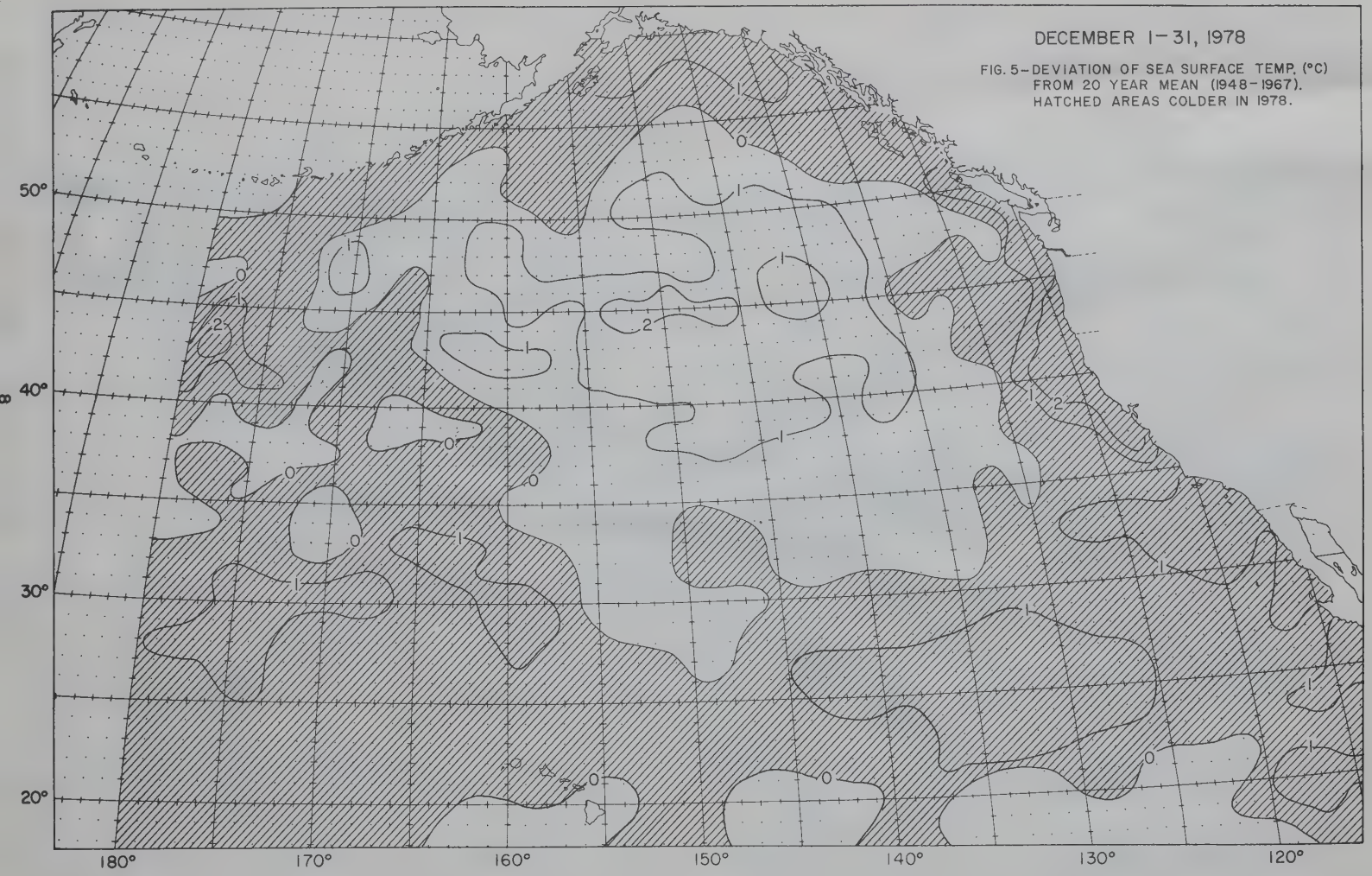

DECEMBER 1978
FIG. 2 – OBSERVED VALUES
–0000– BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.)
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1000
1004
1008
1012
1016
1020
1024
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

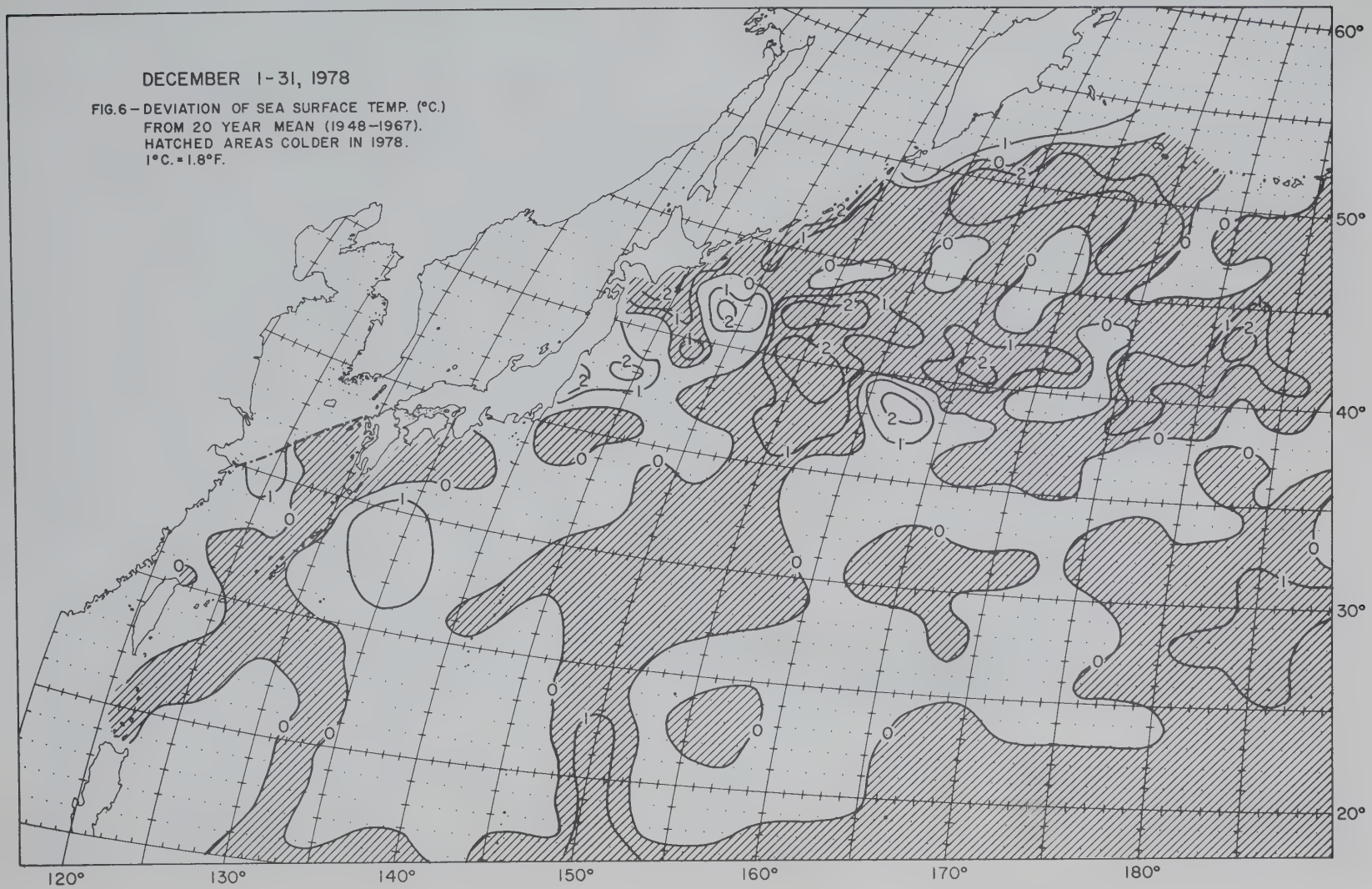

DECEMBER 1-31, 1978
FIG.3-MEAN SEA SURFACE TEMPERATURE (°C)
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
7.8
9.9
9.8
9.8
13.2
13.3
13.8

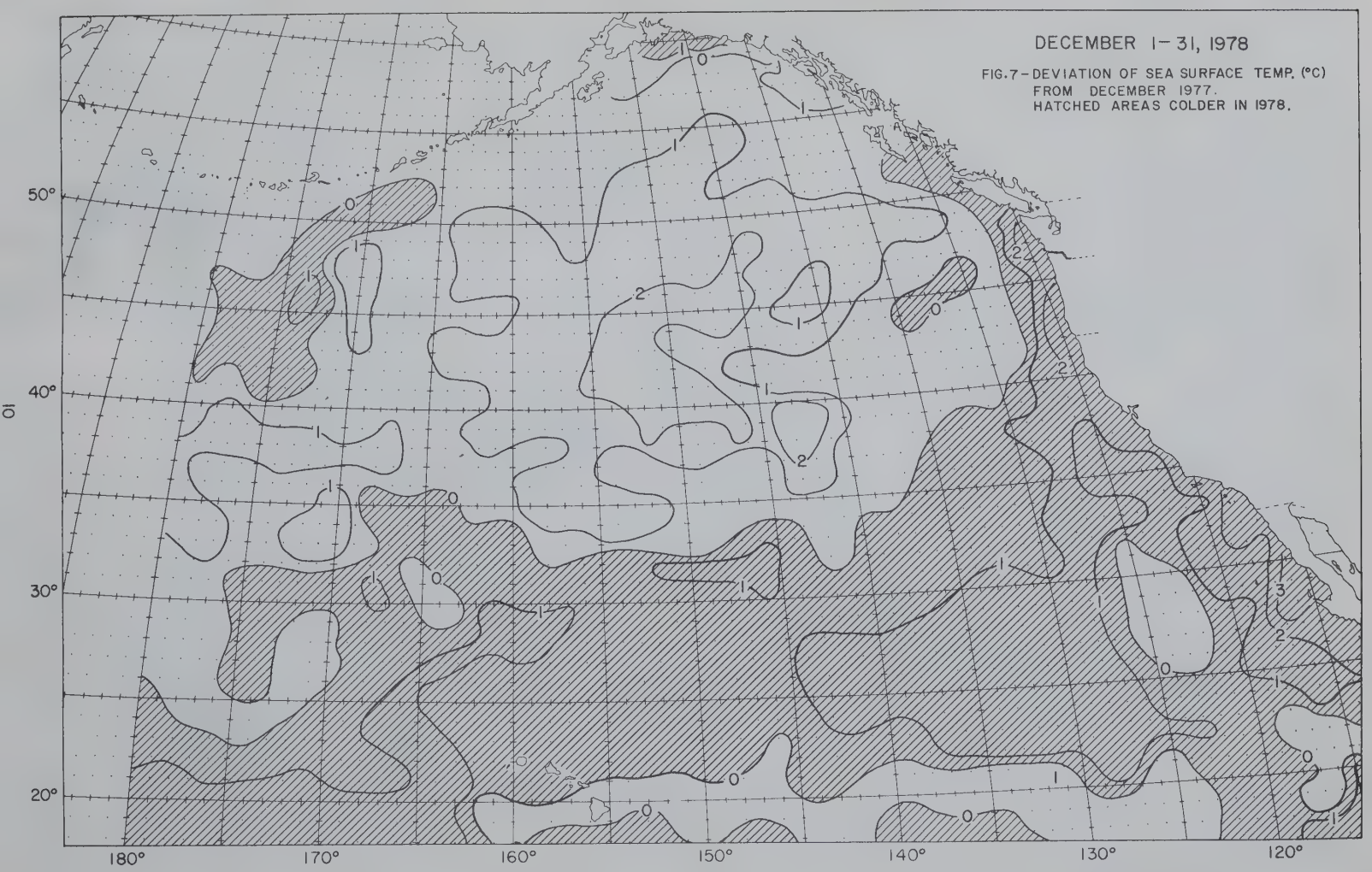
DECEMBER 1-31, 1978

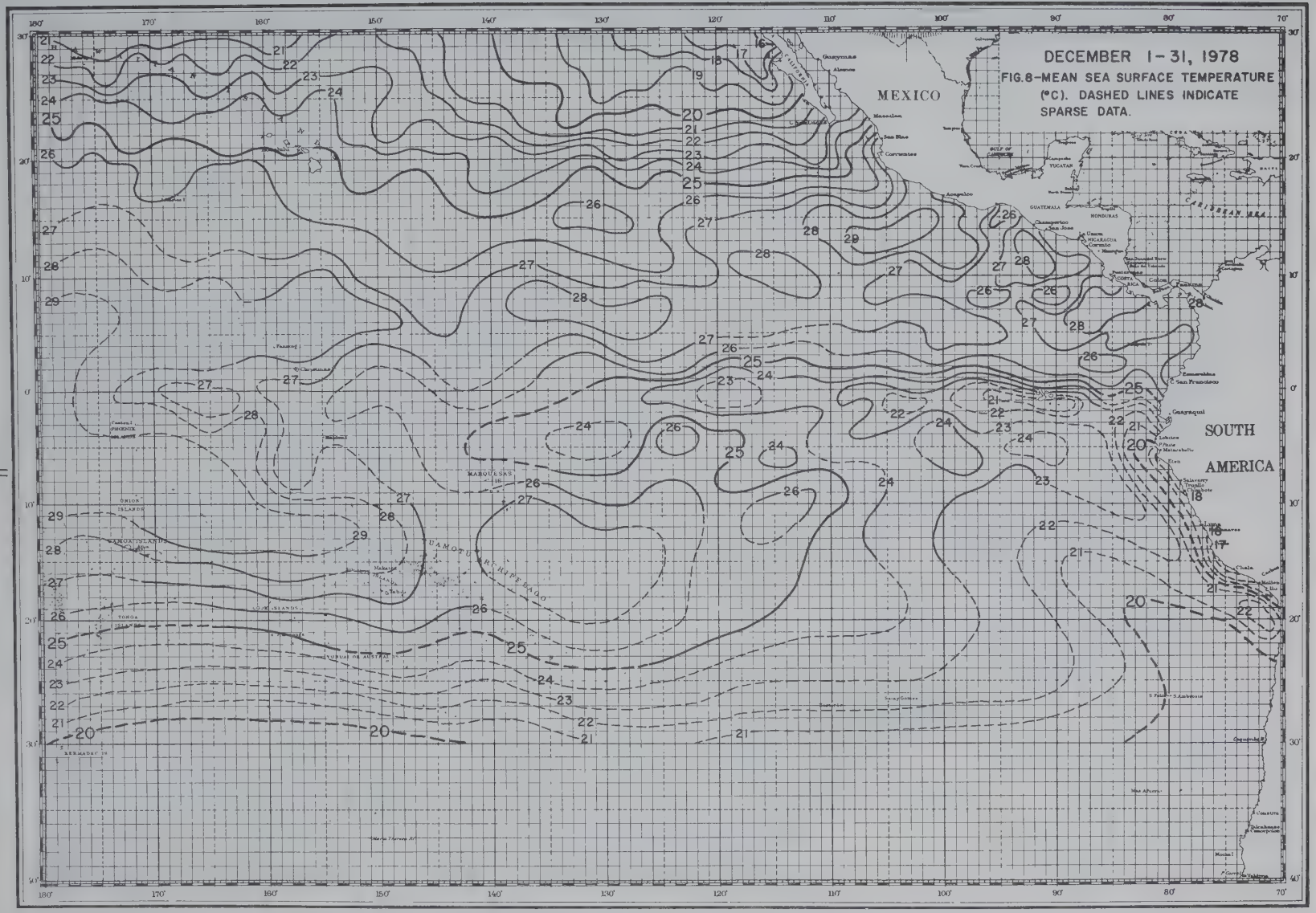
FIG.4—MEAN SEA SURFACE TEMPERATURE (°C)




DECEMBER 1-31, 1978
FIG. 5-DEVIATION OF SEA SURFACE TEMP. (°C) FROM 20 YEAR MEAN (1948-1967). HATCHED AREAS COLDER IN 1978.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31, 1978
FIG.6 – DEVIATION OF SEA SURFACE TEMP. (°C.)
FROM 20 YEAR MEAN (1948–1967).
HATCHED AREAS COLDER IN 1978.
1°C. = 1.8°F.
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


DECEMBER 1-31, 1978
FIG.7-DEVIATION OF SEA SURFACE TEMP. (°C)
FROM DECEMBER 1977.
HATCHED AREAS COLDER IN 1978.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31, 1978
FIG.8-MEAN SEA SURFACE TEMPERATURE (°C). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
MARQUESAS
UNION ISLANDS
TUAMOTU ARCHIPELAGO
TUBUAI DE AUSTRAL
GUATEMALA
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
Guaymas
Mazatlan
San Blas
Corrientes
Acapulco
Champerico
San Jose
Corinto
Panama
Guayaquil
Salaverry
Trujillo
Chimbote
Lima
Chala
Arica
Mollendo
Iquique
Antofagasta
Caldera
Coquimbo
Valparaiso
Talcahuano
Concepcion
Corral
Mocha I.
Juan Fernandez Is.
Easter I.
Pitcairn I.
Henderson I.
Ducie I.
Oeno I.
Raivavae
Rapa
Rurutu
Tubuai
Rimatara
Rurutua
Tahiti
Moorea
Maiao
Tahuata
Hivaoa
Nukuhiva
Fatuhiva
Ua Huka
Ua Pou
Christmas
Fanning I.
Canton I.
PHOENIX ISLANDS
ENDERBURY I.
FAKAOFO
NUKUNONU
ATAFU
TOKELAU ISLANDS
SWAINS I.
PENRHYN
MANIHIKI
RAKAHANGA
PUKAPUKA
NASSAU I.
SUWARROW
PALMERSTON I.
AITUTAKI
MANGAIA
RAROTONGA
MANUAE
TAKAROA
PUKAPUKA
NORTHUMBERLAND I.
Clipperton I.
Socorro I.
Revillagigedo Is.
Guadalupe I.
Cedros I.
Natividad I.
San Benito Is.
Cerros I.
Asuncion I.
Magdalena B.
Cabo San Lucas
Cabo Corrientes
Tres Marias Is.
Isabel I.
Farallon de Pajaros
Farallon de Medinilla
Guam
Saipan
Tinian
Rota
Aguijan
Tinian
Pagan
Agrihan
Asuncion
Maug Is.
Farallon de Pajaros
Uracas
Bonin Is.
Volcano Is.
Marcus I.
Wake I.
Johnston I.
Palmyra I.
Kingman Reef
Jarvis I.
Howland I.
Baker I.
Phoenix Is.
Gilbert Is.
Ellice Is.
Tuvalu
Funafuti
Nanumea
Nanumanga
Niutao
Nui
Vaitupu
Nukufetau
Nukulaelae
Niulakita
Rotuma
Fiji Is.
Suva
Lau Is.
Tonga Is.
Nuku'alofa
Vava'u Is.
Ha'apai Is.
Niuafo'ou
Niuatoputapu
Futuna Is.
Wallis I.
Alofi I.
Uvea I.
Samoa Is.
Apia
Upolu
Savaii
Manua Is.
Tutuila
Aunuu I.
Rose I.
Swains I.
Tokelau Is.
Fakaofo
Nukunonu
Atafu
Union Is.
Fakaofo
Nukunonu
Atafu
Tokelau Is.
Swains I.
Rose I.
Aunuu I.
Tutuila
Manua Is.
Savaii
Upolu
Apia
Samoa Is.
Uvea I.
Alofi I.
Wallis I.
Futuna Is.
Niuatoputapu
Niuafo'ou
Ha'apai Is.
Vava'u Is.
Nuku'alofa
Tonga Is.
Lau Is.
Suva
Fiji Is.
Rotuma
Funafuti
Nanumea
Nanumanga
Niutao
Nui
Vaitupu
Nukufetau
Nukulaelae
Niulakita
Tuvalu
Gilbert Is.
Ellice Is.
Phoenix Is.
Baker I.
Howland I.
Jarvis I.
Kingman Reef
Palmyra I.
Johnston I.
Wake I.
Marcus I.
Bonin Is.
Volcano Is.
Uracas
Farallon de Pajaros
Maug Is.
Asuncion
Agrihan
Pagan
Tinian
Saipan
Guam
Rota
Aguijan
Tinian
Farallon de Medinilla
Farallon de Pajaros
Isabel I.
Tres Marias Is.
Cabo Corrientes
Cabo San Lucas
Magdalena B.
Asuncion I.
Cerros I.
San Benito Is.
Natividad I.
Cedros I.
Guadalupe I.
Revillagigedo Is.
Socorro I.
Clipperton I.
Oeno I.
Ducie I.
Henderson I.
Pitcairn I.
Easter I.
Juan Fernandez Is.
Mocha I.
Concepcion
Talcahuano
Valparaiso
Coquimbo
Caldera
Antofagasta
Iquique
Arica
Chala
Mollendo
Lima

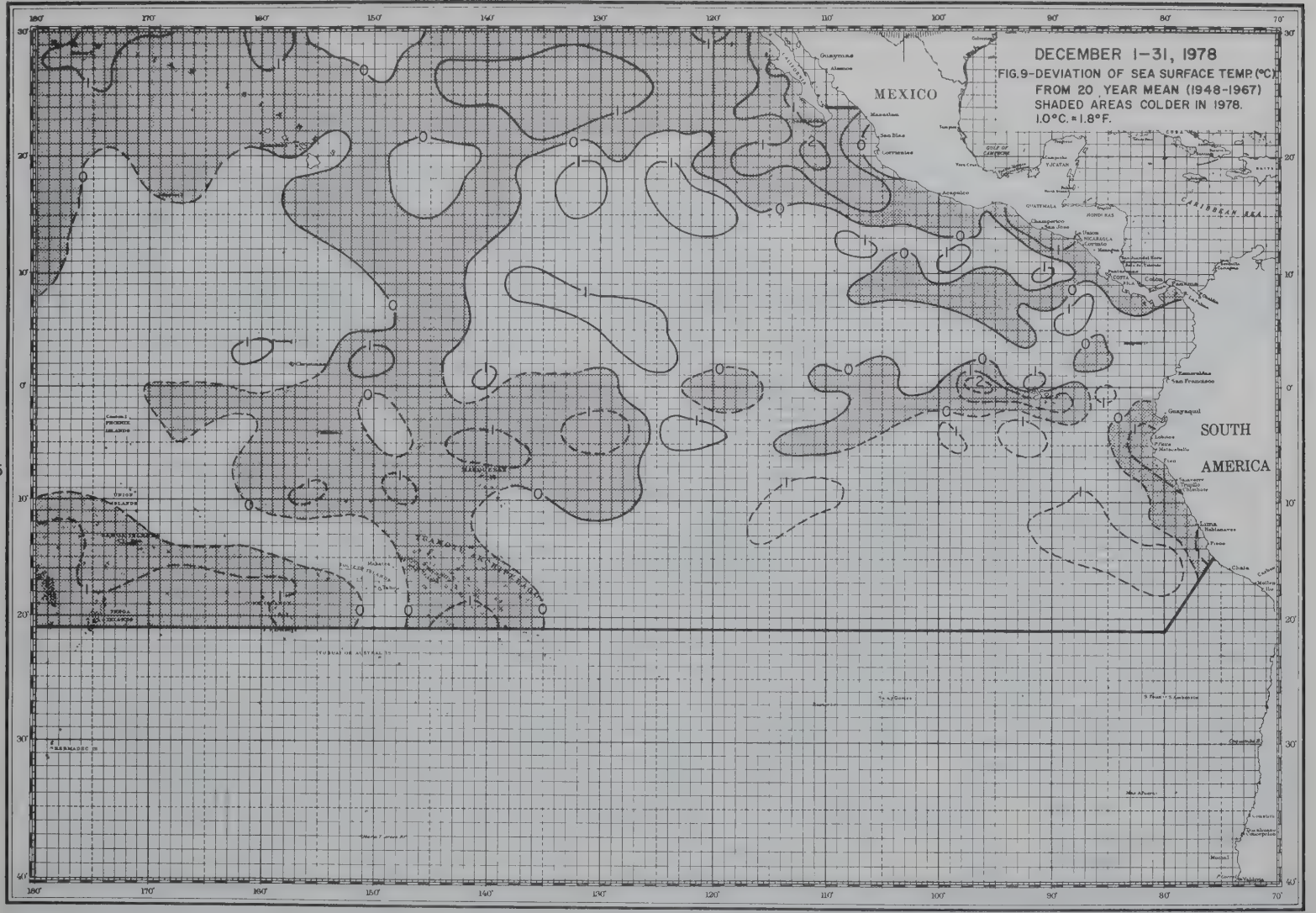

DECEMBER 1–31, 1978
FIG. 9–DEVIATION OF SEA SURFACE TEMP. (°C)
FROM 20 YEAR MEAN (1948–1967)
SHADED AREAS COLDER IN 1978.
1.0°C. = 1.8°F.
MEXICO
SOUTH
AMERICA
CARIBBEAN AREA
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°
10°
20°
30°
40°

FIGURE 10

SHIP HAWAIIAN QUEEN

VOYAGE 234

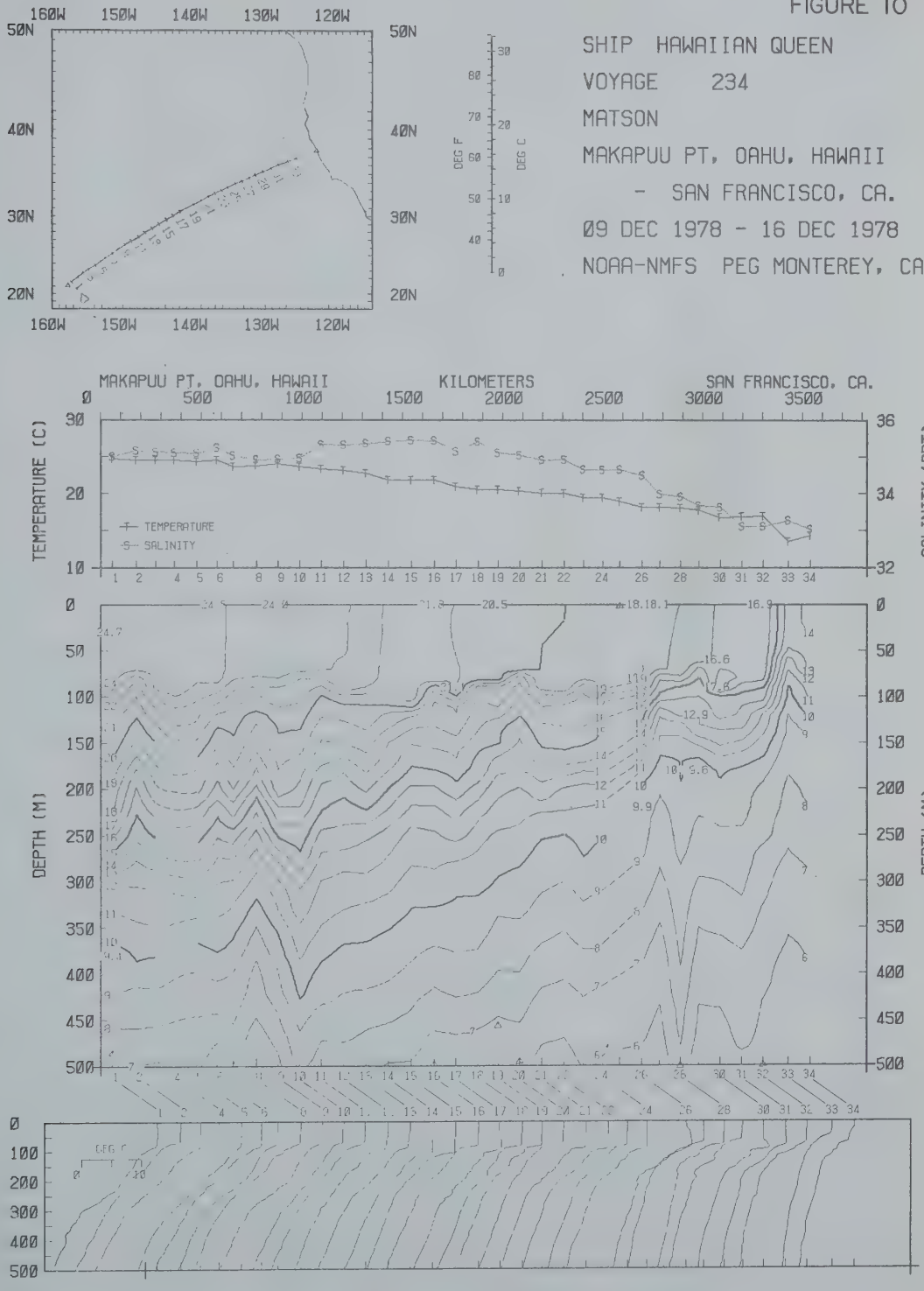
MATSON

MAKAPUU PT, OAHU, HAWAII

- SAN FRANCISCO, CA.

09 DEC 1978 - 16 DEC 1978

NOAA-NMFS PEG MONTEREY, CA.



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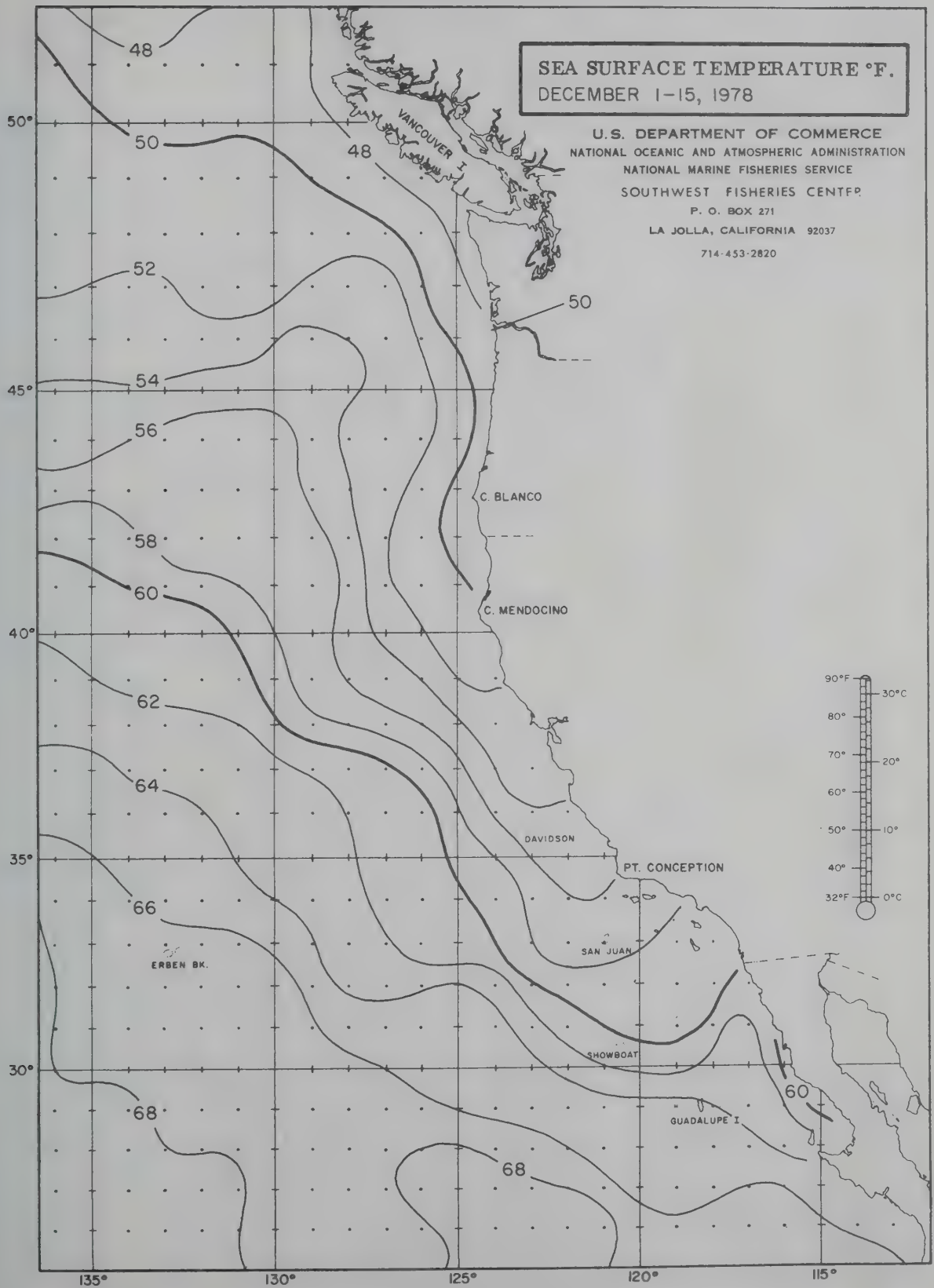

FISHING INFORMATION – supplement